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EXAMINER	
BRINEY III, WALTER F	
ART UNIT	**PAPER NUMBER**
2644	7

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No. 09/588,064	Applicant(s) YEAP ET AL.	
	Examiner Walter F Briney III	Art Unit 2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 March 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4-9 and 11-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *6,7,13 and 14* is/are allowed.

6)☒ Claim(s) *1,2,4,5,8,9,11,12,15 and 16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

The drawings were received on 1 March 2004. These drawings are accepted by the examiner.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1 and 8 are rejected under 35 U.S.C. 102(e) as being anticipated by Overbury (US Patent 5,832,032).

Claim 1 is limited to **a noise cancellation circuit for a communications channel comprising a differential signal path and a common mode signal path connected to respective inputs of a summing device, the differential signal path comprising input means connected to the channel for receiving a differential signal therefrom and supplying the differential signal to a first of the inputs of the summing device**; Overbury discloses a differential signal derived from a subscriber loop through a transformer that is combined with the common mode signal with an adder (figure 10, element diff(t), 102 and column 6, lines 17-26). **The common mode**

signal path comprising extraction means coupled to the channel for extracting therefrom a common mode signal, and coupling means for coupling at least part of the extracted common mode signal to the second of the inputs of the summing device as a common mode noise estimate signal; Overbury discloses a common mode signal that is derived from the subscriber loop through resistors (i.e. extraction means) connected to the subscriber loop and is coupled to the summer after being weighted (i.e. common mode noise estimate signal) (figure 10, element cm(t), 111, 102 and column 6, lines 17-26). **The coupling means comprising a circuit element having a capacitance equivalent to stray capacitance coupling between an input and an output, respectively, of the input means**; Overbury discloses a weighted function that is made of complex components (i.e. capacitive) that adjust the phase and amplitude (i.e. effects of capacitive coupling) to match the differential signal component (figure 10, element 111 and column 5, line 55 through column 6, line 4). **The circuit further comprising means for compensating for phase differences between the differential signal and common mode noise estimate signal before their application to the summing device**; Overbury discloses a weight that adjusts to minimize interference between the differential and common mode signal, and incorporates phase shifting to do that (column 5, line 55 through column 6, line 4). **The summing device providing as an output signal of the noise cancellation circuit the difference between the differential signal and the common mode noise estimate signal**; Overbury discloses a summer that combines a differential signal with a weighted common mode signal that is phased to produce a differential signal that has

minimized interference (column 5, line 19 through column 6 line 4). Therefore, Overbury anticipates all limitations of the claim.

The method of claim 8 is anticipated by the inherent operation of the noise cancellation circuit of claim 1, therefore, claim 8 is rejected for the same reasons as claim 1.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 4 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Overbury in view of Felsberg et al. (US Patent 3,825,843).

Claim 4 is limited in part to the noise cancellation circuit according to claim 1, as covered by Overbury. Therefore, Overbury discloses all limitations of the claim except **wherein the first compensating means comprises an analog delay unit interposed between the input means and the summing device and having a delay period substantially equal to delay introduced in the analog common mode signal path**. Felsberg teaches to add a delay line made of coaxial cable (i.e. analog delay unit) to distortion cancellation circuits for the purpose of equalizing the delay between the input signal path (i.e. input means) and the derived compensation signal (i.e. analog common mode signal path) so their initial phase relationship is maintained at the output (i.e.

summing device) (figure 2, element 13 and column 4, lines 27-51). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a delay line for the purpose of equalizing the delay between the input signal path and the derived compensation signal so their initial phase relationship is maintained at the output.

Claim 11 is rejected for the same reasons as claim 4.

Claims 2 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bingel et al. (US Patent 6,173,021) in view of Eaton et al. (US Patent 4,287,475) and further in view of Overbury

Claim 2 is limited in part to **a noise cancellation circuit for a communications channel comprising a differential signal path**; Bingel discloses a differential receiver (figure 2, element 15 and column 3, lines 2-5). **A common mode signal path**; Bingel discloses a detector for receiving electromagnetic interference (i.e. common mode). **Connected to respective inputs of a digital adder**; Bingel discloses an adder (figure 2, element 12). **The differential signal path comprising input means connected to the channel for receiving a differential signal**; Bingel discloses a differential receiver (figure 2, element 15 and column 3, lines 2-5). **Therefrom and analog-to-digital converter means coupled to the input means for digitizing the received differential signal and applying the digitized differential signal to a first of the inputs of the digital adder**; Bingel discloses an ADC (figure 2, element 21) and an input to an adder (figure 2, element 12). **The common mode signal path comprising extraction means coupled to the channel for extracting therefrom a common mode signal**; Bingel discloses a detector for receiving electromagnetic interference (i.e.

common mode). **A second analog-to-digital converter means coupled to the extraction means for digitizing the extracted common mode signal**; Bingel discloses a second ADC (figure 2, element 16). **Adaptive filter filtering the digitized common mode signal to produce a digital common mode noise estimate signal and applying the digital estimate signal to the second input of the digital adder**; Bingel discloses a DSP that is adaptive (column 4, lines 7-13) that produces an interference cancellation signal (i.e. digital common mode noise estimate signal) (column 4, lines 13-16) and applies it to an adder (figure 2, element 12). **The adder providing as an output signal of the noise cancellation circuit the difference between the differential signal and the digital common mode noise estimate signal**; Bingel discloses an adder that eliminates interference thus producing an output signal by summing a wanted signal with noise to an estimated interference signal (figure 2, elements 12-13 and column 3, lines 24-27). Even though Bingel discloses the adaptive filter, there is no mention of how to detect noise and further cancel it. Therefore, Bingel discloses all limitations of the claim with the exception of **applying the digitized extracted common mode signal to a noise detector for detecting frequency bands of the common mode signal wherein noise exceeds a predetermined level and passing only those portions of the digitized common mode signal in the detected frequency bands to an adaptive filter**; Eaton teaches a circuit for adaptive suppression of narrow band interference (e.g. RFI) (abstract). Eaton teaches that the filter receives as input a digital signal that is converted to frequency by a Z transform circuit (figure 1, element 7). A PSD is detected, and a threshold device

applies the PSD to a reference control (i.e. predetermined level) to detect which bins are noisy. Eaton teaches that only noisy bins are filtered out by the adaptive filter (column 4, lines 8-22). It would have been obvious to one of ordinary skill in the art at the time of the invention to implement the noise detector and filter as taught by Eaton for the purpose of providing the noise detection and adaptive filtering required by Bingel. Even though it would have been obvious to combine Eaton with Bingel, Eaton is not adapted for canceling common mode noise from differential noise, and the details of the adaptive filter are ambiguous. Therefore, Bingel in view of Eaton makes obvious all limitations of the claim with the exception of **control means having inputs connected to the differential signal path and the common mode signal path**. Overbury teaches to use a control means connected to both the differential and common mode noise path (figure 10, element 109, 105, 108). **Determining correlation between signals in the differential signal path and common mode signal path and adjusting coefficients of the adaptive filter in dependence thereupon so as to reduce correlation between the differential and common mode signals**; Overbury teaches that a correlation process should be used with reference to the signal paths (figure 10, elements 105, 108, 109) to determine the weight function (i.e. adaptive filter), and a weight update signal will be sent to the weight function to adjust its values (i.e. adjust coefficients) for the purpose of canceling interference below the level of the wanted signal (column 6, lines 44-48). **The circuit further comprising means for compensating for phase differences between the differential signal and the common mode signal before their application to the digital adder**; Overbury

teaches that the weight function adjusts for phase differences between the two signals (i.e. differential signal and the common mode signal) before adding them together (column 6, lines 1-4). It would have been obvious to one of ordinary skill in the art at the time of the invention to include the control means, correlation function and phase difference compensating means taught by Overbury to the adaptive filter of Bingel in view of Eaton for the purpose of adapting the adaptive filter taught by Eaton for use in the common mode canceling circuitry of Bingel.

The method of claim 9 is anticipated by the inherent operation of the noise cancellation circuit of claim 2, therefore, claim 9 is rejected for the same reasons as claim 2.

Claims 5, 12, 15, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bingel in view of Overbury in view of Felsberg and further in view of Eaton.

Claim 15 is limited to **a noise cancellation circuit for a communications channel**. Bingel discloses a method and apparatus for reducing interference in a twisted-wire pair transmission system (abstract). Bingel discloses **input means** (figure 2, element 15) **coupled to the channel for extracting a differential signal therefrom**. Bingel discloses **common mode signal extraction means** (figure 2, element 9) **coupled to the channel for extracting therefrom a common mode signal**. Bingel discloses **a digital common mode signal path comprising a second analog-to-digital converter** (figure 2, element 16) **coupled to the common mode signal extraction means** (figure 2, element 9) **for converting the common mode signal to a**

digital common mode signal. Bingel discloses **a digital noise detector** (figure 2, element 19) **coupled to the second analog-to-digital converter** (figure 2, element 16) **for detecting noise in the common mode signal**. Bingel discloses **an adaptive filter** (figure 2, element 19) **coupled to the digital noise detector for filtering the selected portions of the digital common mode signal to produce a digital common mode estimate signal** (figure 2, element 11) **and applying the digital common mode estimate signal to a second input of the digital adder** (figure 2, element 12). Bingel discloses **a digital differential path portion comprising an analog-to-digital converter** (figure 2, element 21). As shown, Bingel discloses a digital data path. However, there is no suggestion for an analog signal path. Therefore, Bingel anticipates all limitations of the claim with the exception of **the analog differential signal and analog common mode signal path**. Overbury teaches that RFI effects differential signals (column 1, lines 50-54). In order to prevent the differential signal from overloading ADCs (column 1, lines 54-61) in the differential signal path, Overbury couples an analog RFI canceller system between the differential input means and a analog-to-digital converter (figure 10). Overbury teaches **a differential signal path having an analog portion coupled between the input means** (Overbury, figure 10, transformer coupled to 100 and 101) **and a first input of an analog summing device** (Overbury, figure 10, element 102) **and a digital portion coupled between an output of the analog summing device** (Overbury, figure 10, element 102) **and a first input of a digital adding means** (Bingel, figure 2, element 12). Overbury teaches **an analog common mode signal path** (figure 10, cm(t)). Bingel discloses **a digital common**

mode signal path (Bingel, figure 2, output of ADC 16). Overbury teaches **analog coupling means** (figure 10, element 111) **connected between the common mode extraction means** (Overbury, figure 10, resistors connected to 100 and 101) **and a second input of the analog summing means** (Overbury, figure 10, element 102). Overbury teaches that the filter, 111, is adjusted to represent the weighting and phase effects of the differential coupling means (Overbury, column 6, lines 43-48) (i.e. **the coupling means comprising a circuit component having a capacitance equivalent to stray capacitance coupling between the input and the output, respectively, of the input means, for coupling an analog common mode noise estimate signal to the first summing means**). It would have been obvious to one of ordinary skill in the art at the time of the invention to include the analog data path as taught by Overbury for the purpose of preventing saturation of the A/D converter of Bingel. Overbury teaches matching phase with the filter 111, but does not include any delay in the differential signal path. Therefore, Bingel in view of Overbury makes obvious all limitations of the claim with the exception of **first compensating means for compensating for phase differences between the differential signal and analog common mode noise estimate signal before their application to the analog summing device**. Felsberg teaches to add a delay line made of coaxial cable (i.e. analog delay unit) to distortion cancellation circuits for the purpose of equalizing the delay between the input signal path (i.e. **input means**) and the derived compensation signal (i.e. **analog common mode signal path**) so their initial phase relationship is maintained at the output (i.e. **summing device**) (figure 2, element 13 and column 4, lines 27-51). It would have been

obvious to one of ordinary skill in the art at the time of the invention to use a delay line for the purpose of equalizing the delay between the input signal path and the derived compensation signal so their initial phase relationship is maintained at the output. Bingel discloses an adaptive filter (figure 2, element 19), but does not discloses how the adaptive filter adjusts to better eliminate noise signals. Therefore, Bingel in view of Overbury and further in view of Felsberg makes obvious all limitations of the claim with the exception of **second compensating means for compensating for phase differences between the signal output from the first summing means and the digital common mode noise estimate signal before their application to the respective input so of the digital adder means**. Overbury discloses that an adaptive filter used in a noise cancellation application should match the phase and amplitudes of the differential and common mode signal before adding them together (column 6, lines 27-48). The process achieves the best results using correlation and adjustment of phase and amplitude (column 6, lines 44-48). To provide this functionality, Overbury discloses an adaptive filter that modifies the common mode signal to be applied to the differential signal (i.e. **second compensating means**). Overbury teaches an analog process, but it is obvious that it is applicable to the digital system of Bingel. Overbury also discloses **control means** (figure 10, element 109) **connected to the differential signal path** (figure 10, diff(t) via 105) **and the digital common mode signal path** (figure 10, cm(t) via 108). Overbury discloses **determining correlation between signals in the differential signal path and digital common mode signal path, respectively, and adjusting coefficients of the adaptive filter in dependence**

thereupon so as to reduce correlation between said signals (column 6, lines 44-48). Bingel discloses an adaptive filter whose output is applied to a **digital adder means** (figure 2, element 12) **providing as an output signal of the noise cancellation circuit the difference between the differential signal and the two common mode noise estimate signals**. It would have been obvious to one of ordinary skill in the art at the time of the invention to implement the adaptive filter of Bingel with the adaptive algorithm control as taught by Overbury for the purpose of providing the best results. Finally, the adaptive process of Overbury was shown to provide narrow band detection of signals, but did not disclose **selecting for output only those portions of the digital common mode signal having a predetermined level of noise**. Eaton teaches a circuit for adaptive suppression of narrow band interference (e.g. RFI) (abstract). Eaton teaches that the filter receives as input a digital signal that is converted to frequency by a Z transform circuit (figure 1, element 7). A PSD is detected, and a threshold device applies the PSD to a reference control (i.e. predetermined level) to detect which bins are noisy. Eaton teaches that only noisy bins are filtered out by the adaptive filter (column 4, lines 8-22). Clearly, the advantage of filtering out only noisy bins prevents the adaptive algorithm from diverging in the absence of distortion. It would have been obvious to one of ordinary skill in the art at the time of the invention to implement the noise detector and filter as taught by Eaton for the purpose of preventing the adaptive algorithm from diverging in the absence of noise.

Claim 16 is rejected for the same reasons as claim 15.

Claims 5 and 12 are rejected for the same reasons as claim 4.

Allowable Subject Matter

Claims 6, 7, 13, and 14 are allowed.

The reasons for allowance are detailed in paper no. 3, filed 28 August 2003.

Response to Arguments

With respect to claims 1 and 8, the applicant alleges that the newly amended claims differentiate the invention from the prior art; the examiner respectfully disagrees. The new limitation, "**a circuit element having a capacitance**," is not any different than "**a capacitive component**", as originally claimed. Further, the "**analog delay means**" is anticipated by the adaptive filter that effects the phase of an analog signal. Thus, it is an analog delay means. Therefore, it has not been shown by the applicant that Overbury does not anticipate all limitations of the circuit as claimed.

Applicant's arguments with respect to claims 2, 9, 15, and 16, filed 1 March 2004, have been considered but are moot in view of the new ground(s) of rejection.

In particular, citing the new limitation of claim 2, which is common to all claims 2, 9, 15, and 16, "**for detecting...wherein noise exceeds a predetermined level and passing only those portions...**", there was no limitation in the originally filed claims to prevent all noise frequencies from being used in an adaptive filter, nor was there criteria (i.e. **a predetermined level**) for detecting the noise. Therefore, the examiner has presented new grounds of rejection necessitated by amendment.

With respect to claims 15 and 16, the applicant alleges that there is no motivation to create a tandem analog/digital noise suppression unit (amendment, page 13, paragraph 5); the examiner respectfully disagrees. Evidence to support the examiner's conclusion is presented in the previous section with respect to claim 15.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Walter F Briney III whose telephone number is 703-305-0347. The examiner can normally be reached on M-F 8am - 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forester W Isen can be reached on 703-305-4386. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and 703-872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-4700.

WFB
6/4/04

MINSUN OH HARVEY
PRIMARY EXAMINER